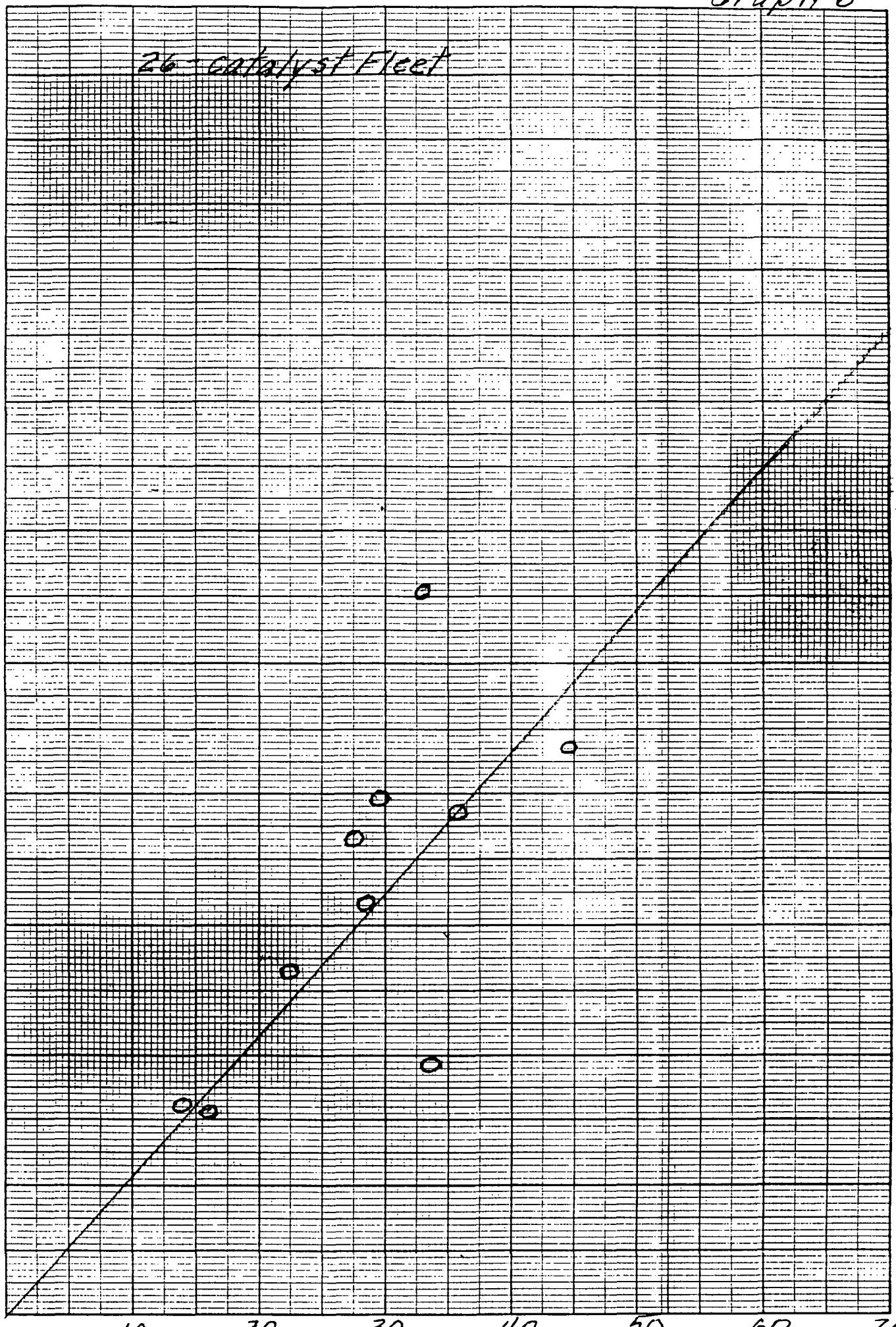


Graph 6

26-catalyst Fleet

3.0  
2.0  
1.0  
0

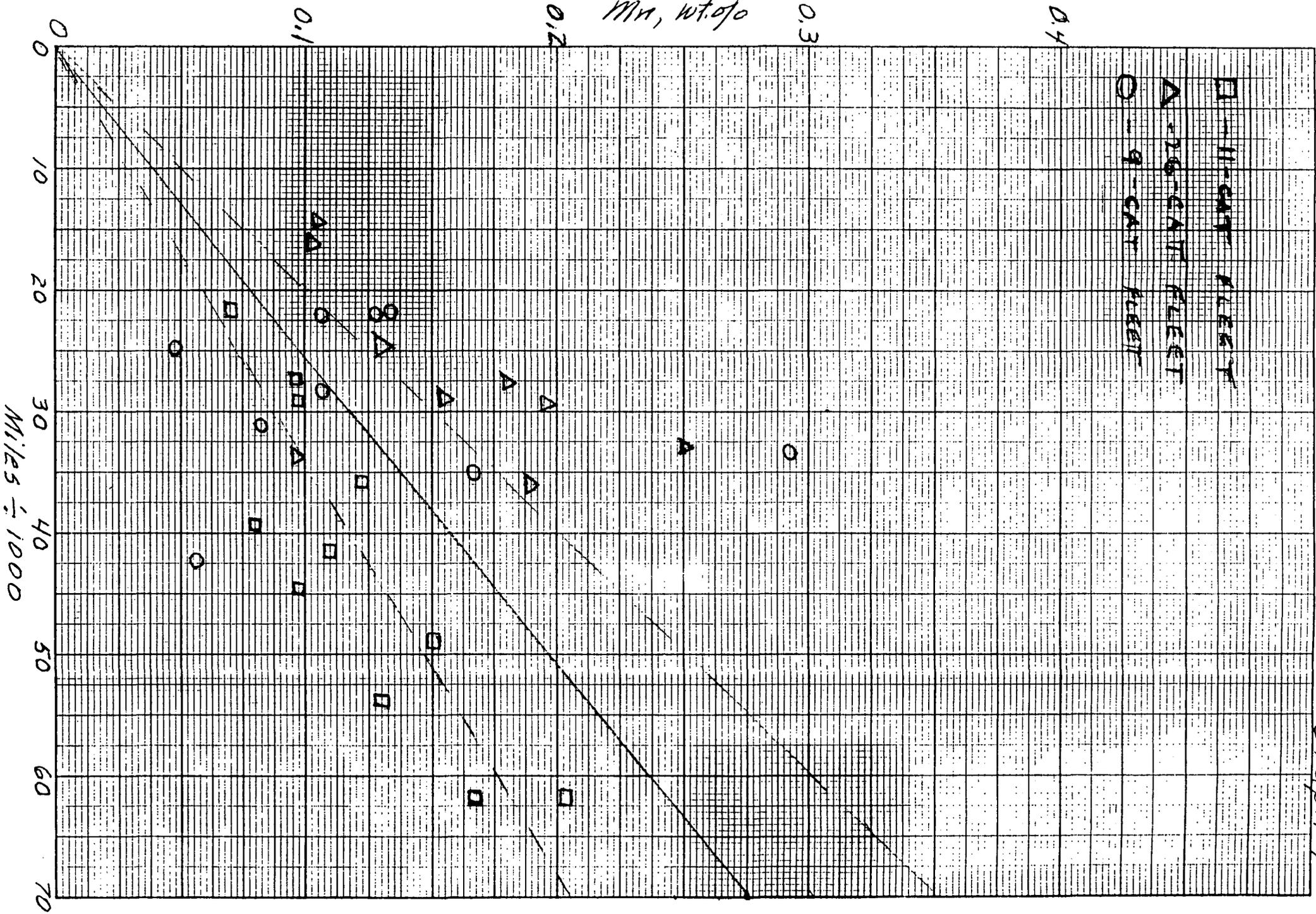
10 20 30 40 50 60 70  
Miles ÷ 1000



K&E 10 X 10 TO 1/2 INCH 46 1323  
7 X 10 INCHES MADE IN U.S.A.  
KEUFFEL & ESSER CO.

MANWTOPE

*Min, wt. of o*



Graph 7

Graph 8

9 - Catalyst Fleet

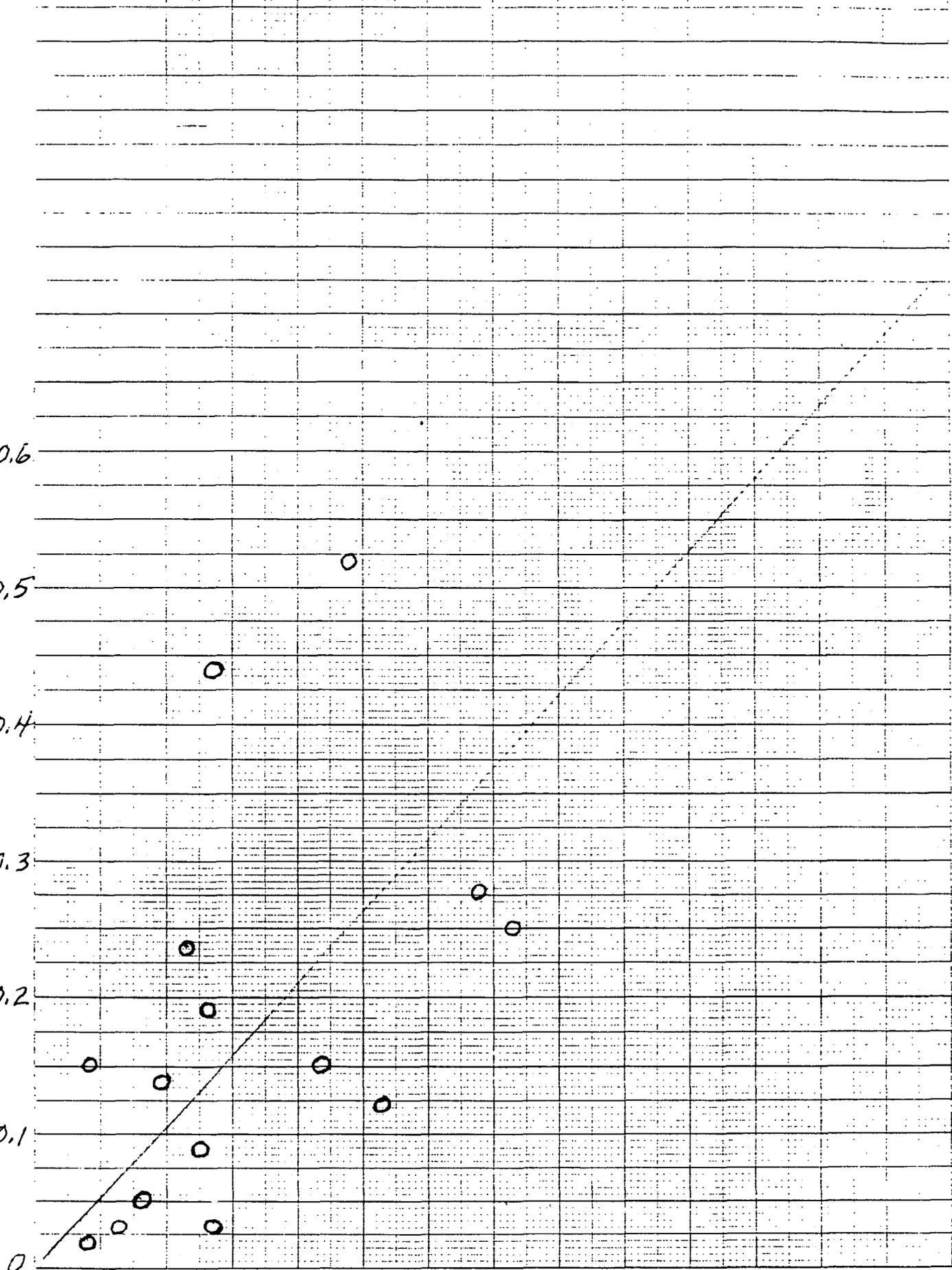
46 1320

Pb, wt. %

K-E 10 X 10 TO 1 INCL. KLU-FLL & ESSER C

0.6  
0.5  
0.4  
0.3  
0.2  
0.1  
0

0 1.0 2.0 3.0 4.0 5.0  
Max. wt. %

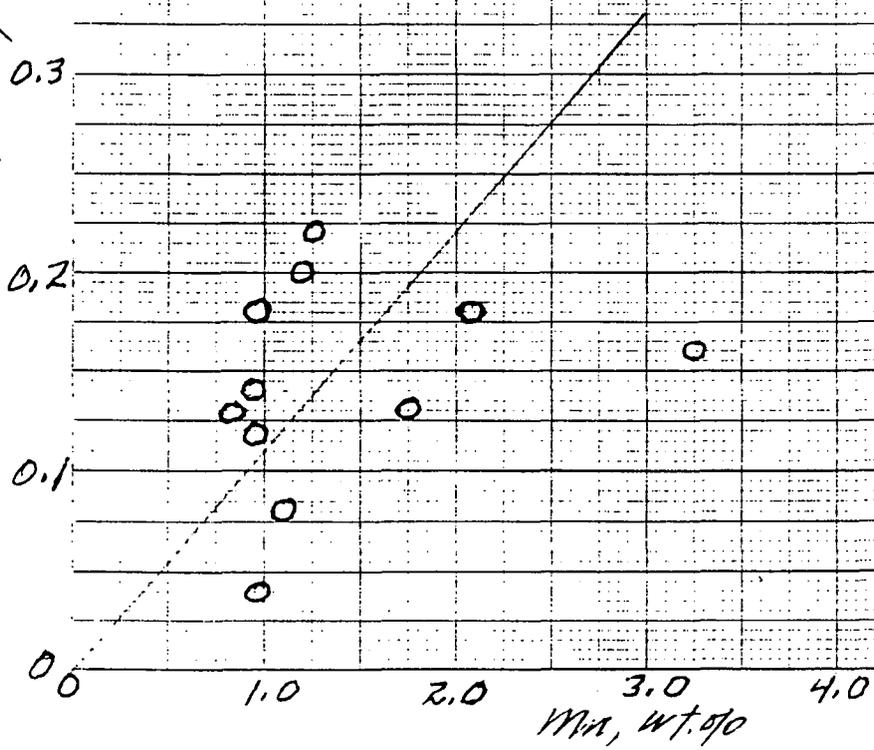


Graph 9

11-catalyst Fleet

46 1320

K&E 10 X 10 TO 1 INCL  
KEUFFEL & ESSER CO. MADE IN U.S.A.  
Pb, wt. %



Graph 10

26-catalyst Fleet

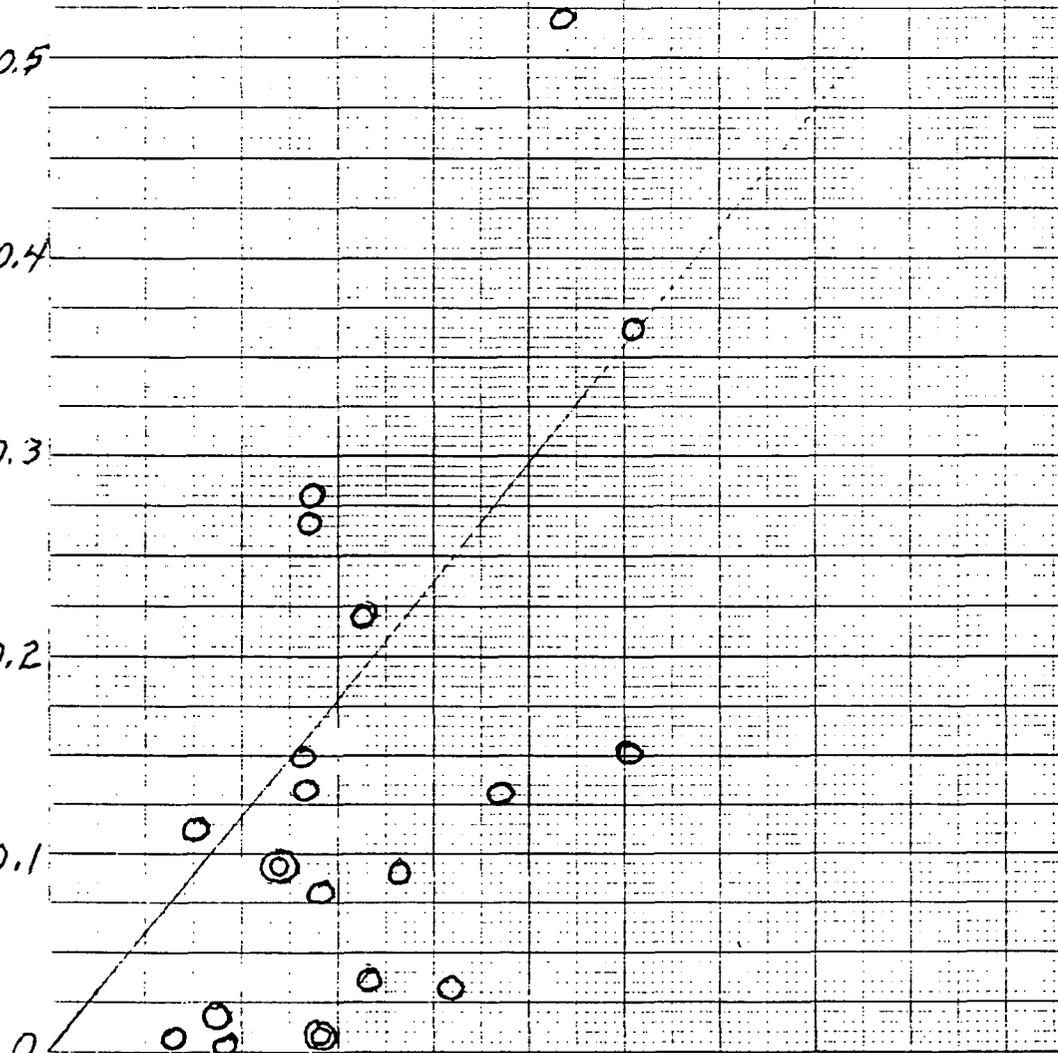
46 1320

K-E 10 X 10 TO 1 INCH  
KEUFFEL & ESSER CO

Pb, wt. %

0.6  
0.5  
0.4  
0.3  
0.2  
0.1  
0

0 1.0 2.0 3.0 4.0 5.0  
Mn wt. %



Graph 11

9-catalyst Fleet

46 1320

K&E 10 X 10 TO 1 INCH  
KLUFFEL & ESSER CO. MADE IN U.S.A.

P, wt. %

0.4

0.3

0.2

0.1

0

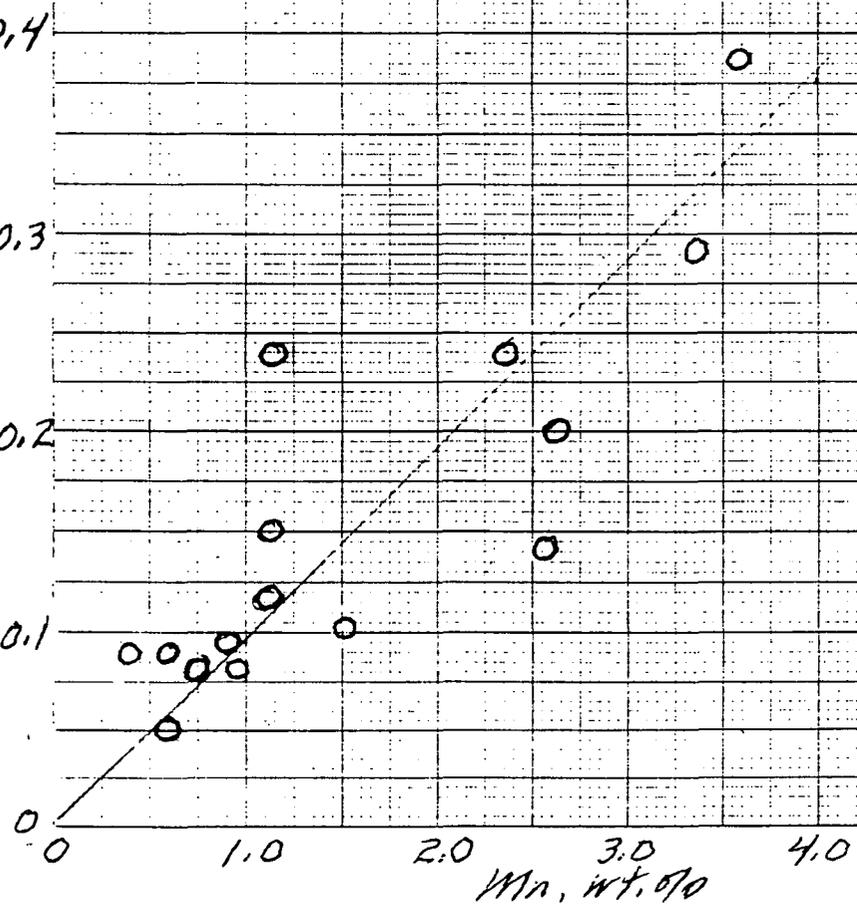
1.0

2.0

3.0

4.0

Mn, wt. %



Graph 12

LA-Catalyst Fleet

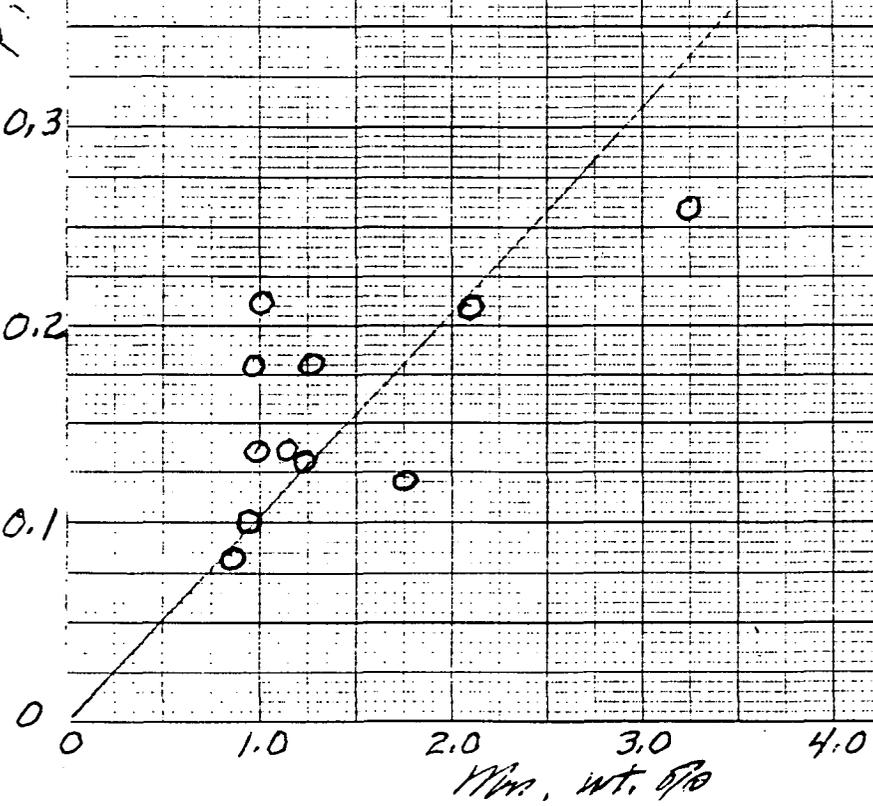
46 1320

K&E 10 X 10 TO 1 INCH  
KLOPFEL & ESSER CO.

$P_1$  wt/10g

0.3  
0.2  
0.1  
0

0 1.0 2.0 3.0 4.0  
Mm, wt. 10g



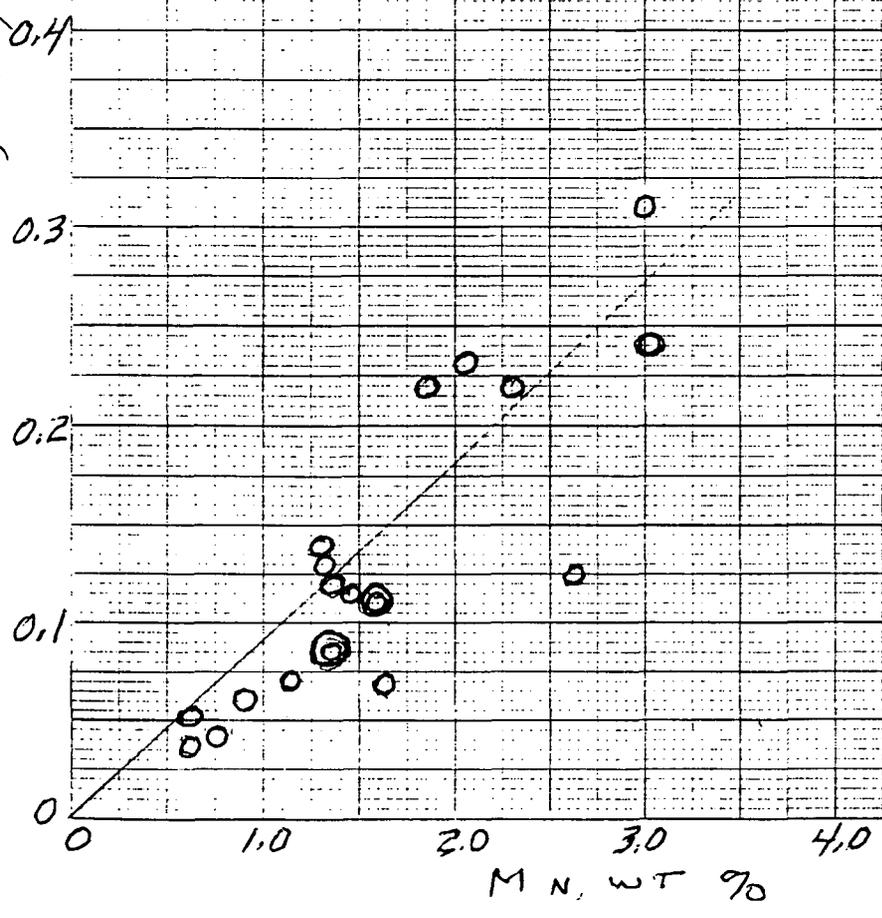
Graph 13

26-Catalyst Fleet

46 1320

K+S 10 X 10 TO 1/2 INCH  
KLUFFEL & LESSER CO.

P, wt. % 0.4



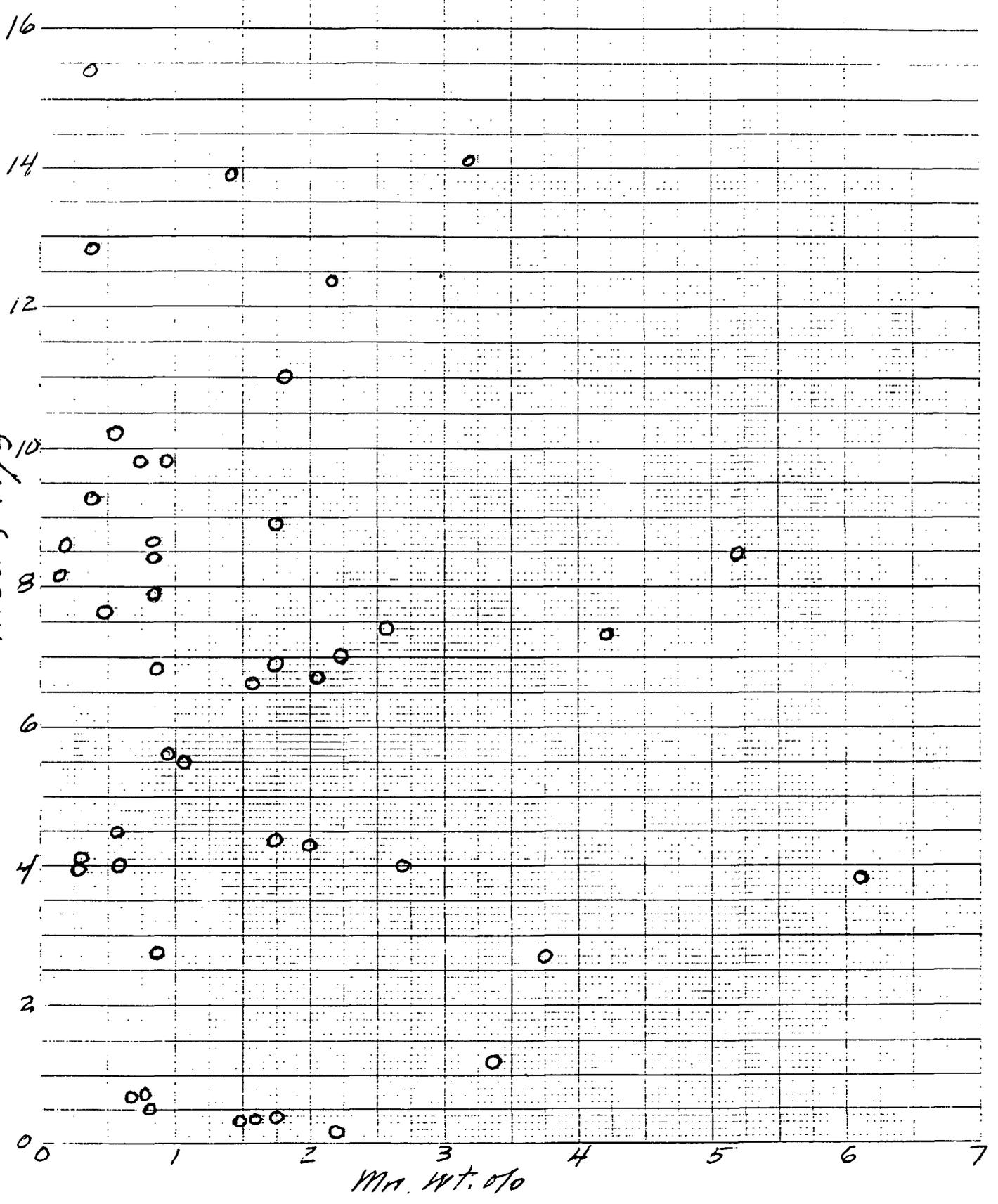
Graph 14

All 3 Elects

46 1320

RE 10 X 10 TO 1 INCH  
KLÜPFEL & LASSER CO.

BET Area, M<sup>2</sup>/g



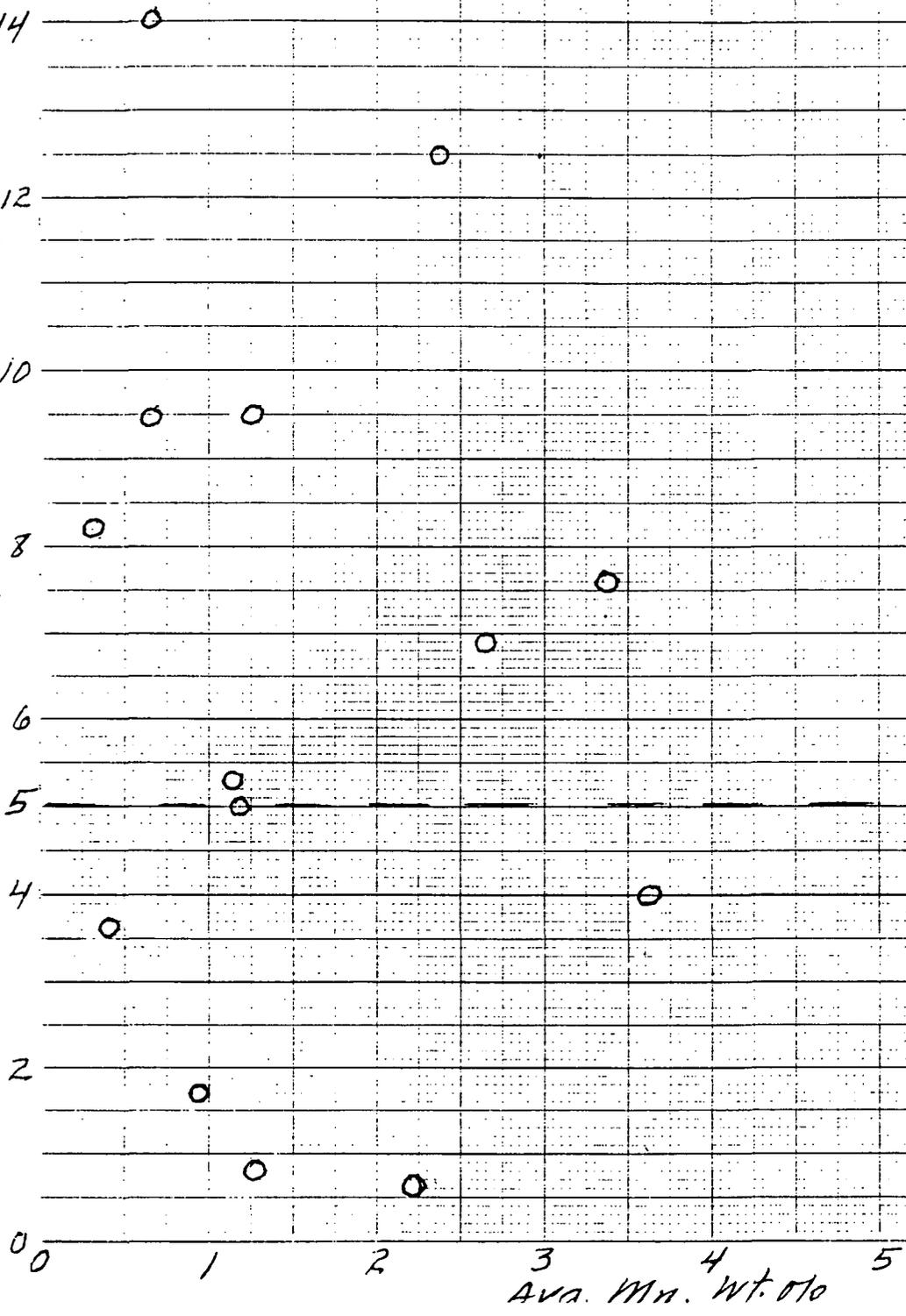
Graph 15

9-catalyst Fleet

46 1320

16 X 10 TO 1 INCH  
KEUFFEL & ESSER CO.

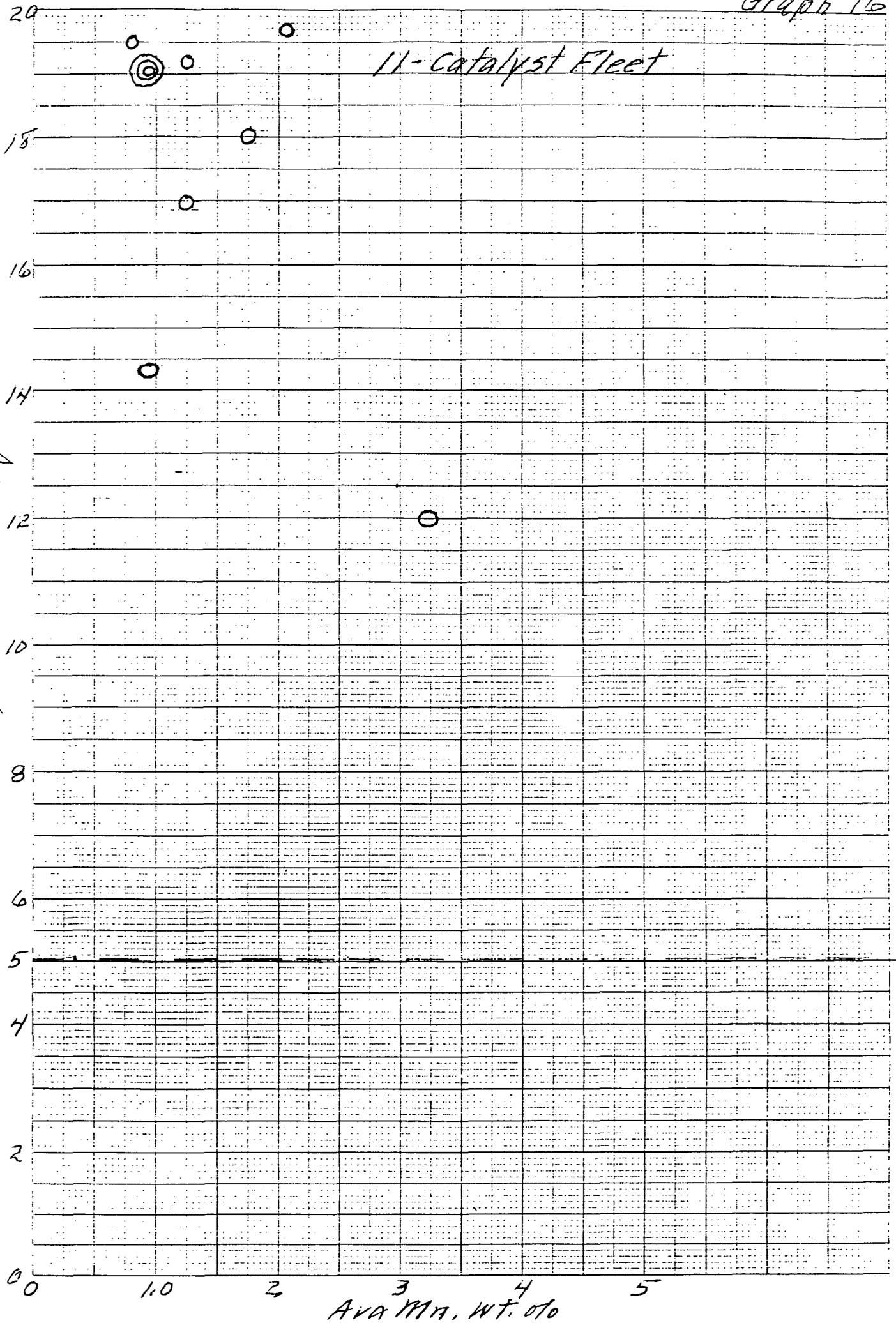
AVG BET AREA, M<sup>2</sup>/g



Graph 16

11-Catalyst Fleet

K&E 10 X 10 TO 1/2 INCH  
KEUFFEL & ESSER CO. 46 1320  
Arg BET Area, M<sup>2</sup>/g



Avg Mn. Wt. %

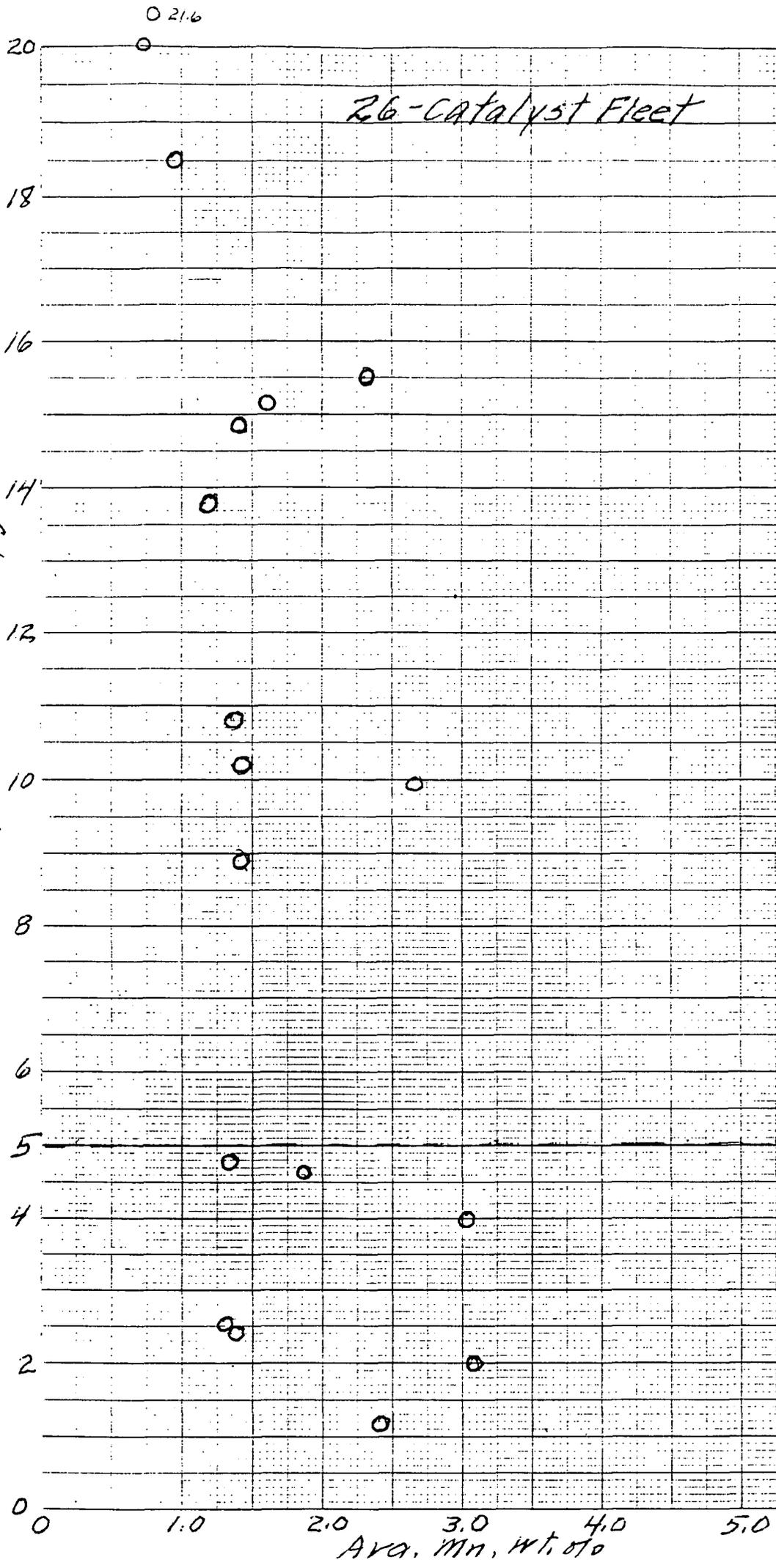
Graph 17

26-Catalyst Fleet

46 1320

Avg BET Area, M<sup>2</sup>/g

K&S 10 X 16 TO 1/2 INCH  
KLUFFEL & ESSER CO



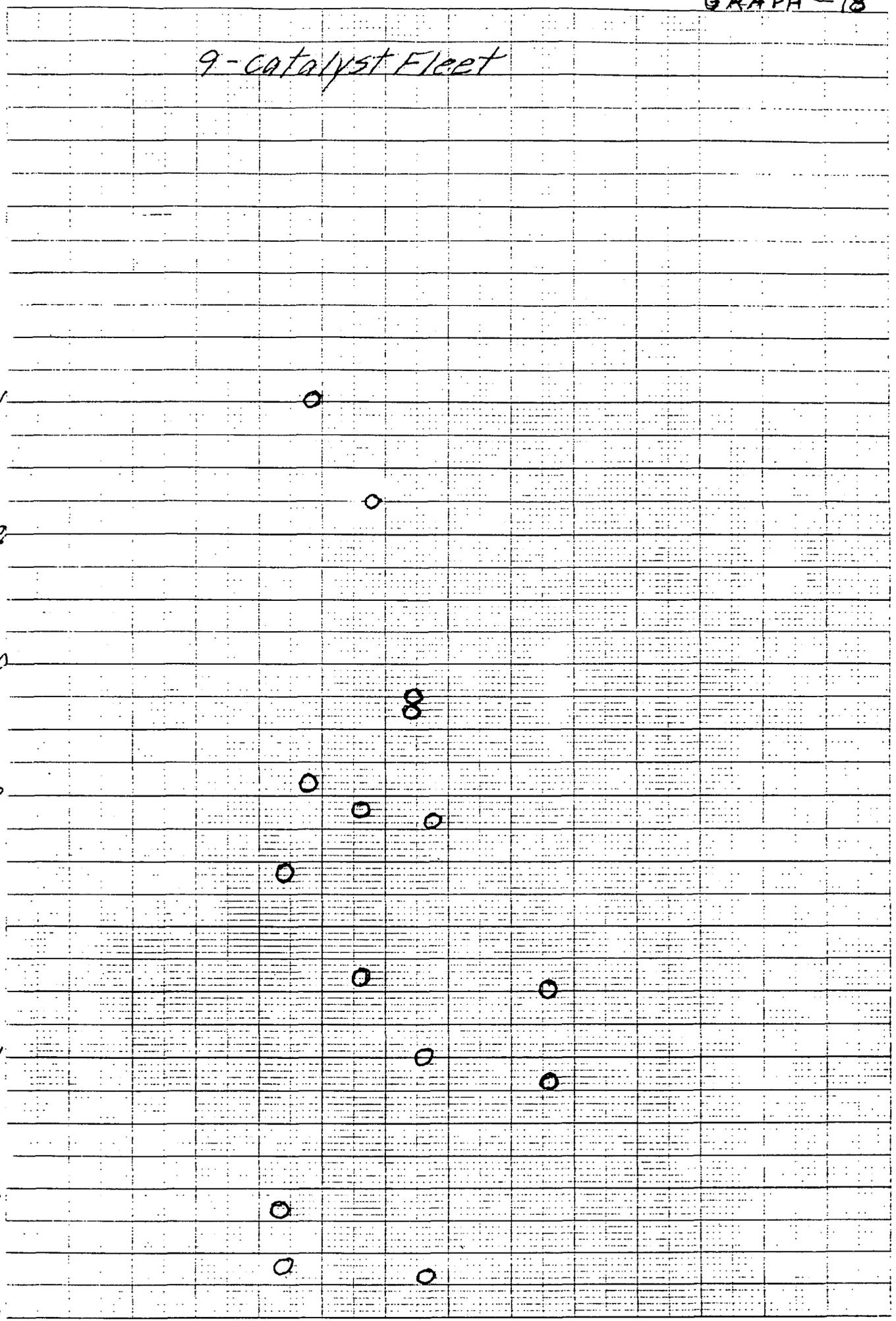
9-catalyst Fleet

46 1320

K-E 1/4 X 1/4 TO 1/2 INCH  
KENTON FEL & LESSER CO.

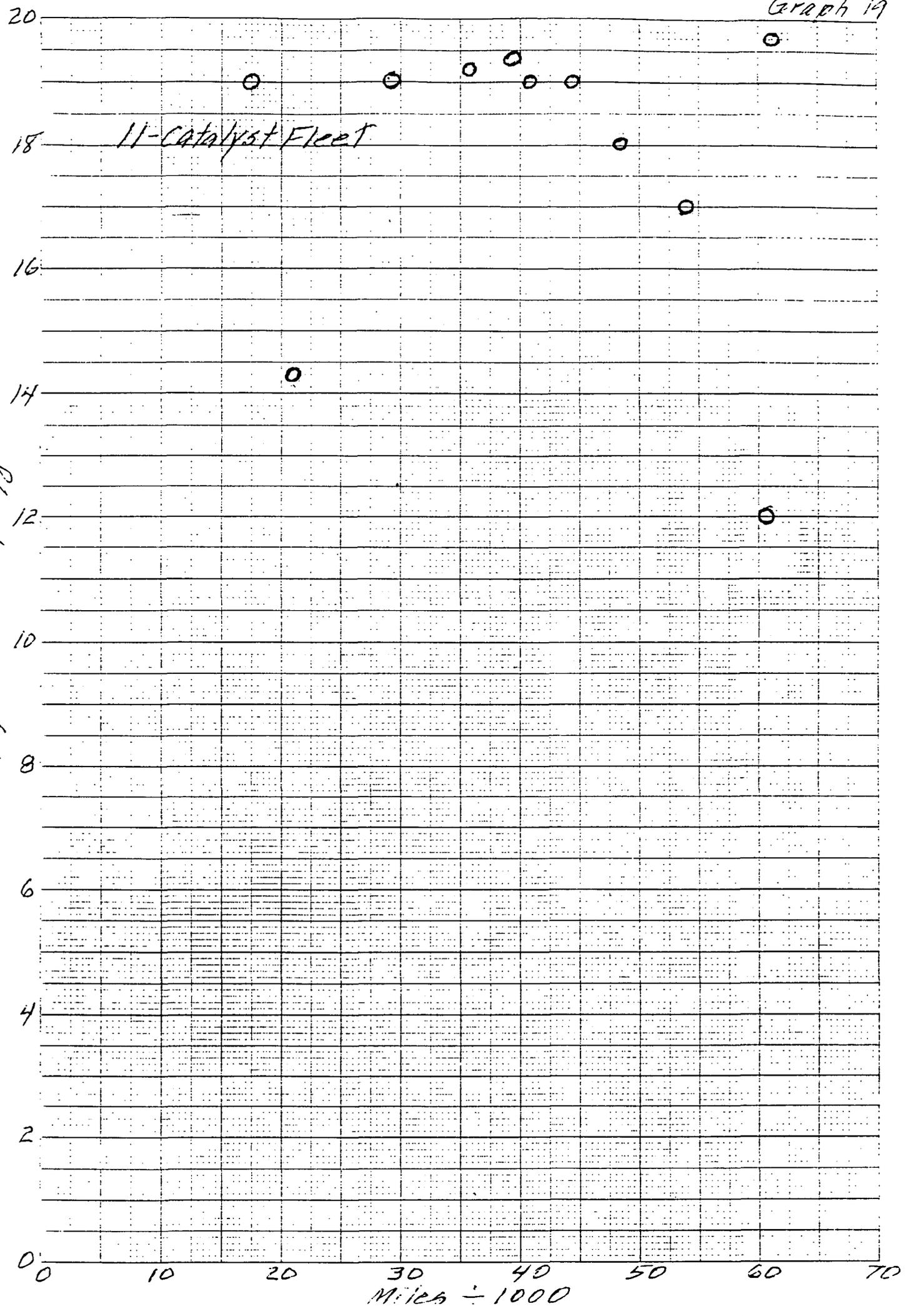
AVG BET AREA, M<sup>2</sup>/g

14  
12  
10  
8  
6  
4  
2  
0



Miles ÷ 1000

Graph 19



11-catalyst Fleet

46 1320  
Avg BET Area, M<sup>2</sup>/g

Miles ÷ 1000

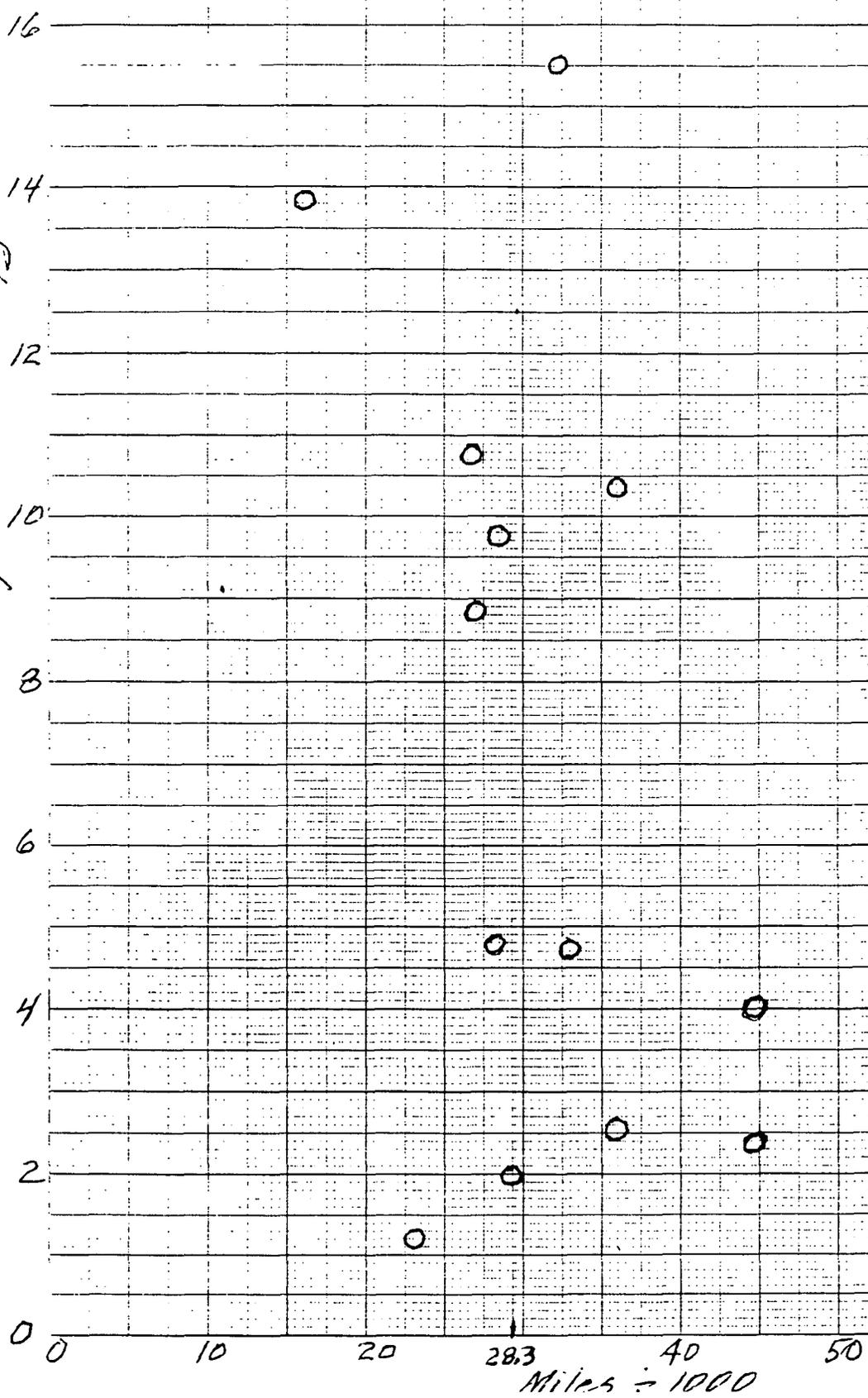
K&E 10 X 10 TO 1/2 INCH KEUFFEL & ESSER CO. MADE IN U.S.A.

Graph 20

26-catalyst Fleet

K&E 10 X 10 TO 1 INCH KEUFEL & ESSER CO. 46 1320

AVG BET AREA, M<sup>2</sup>/g



46

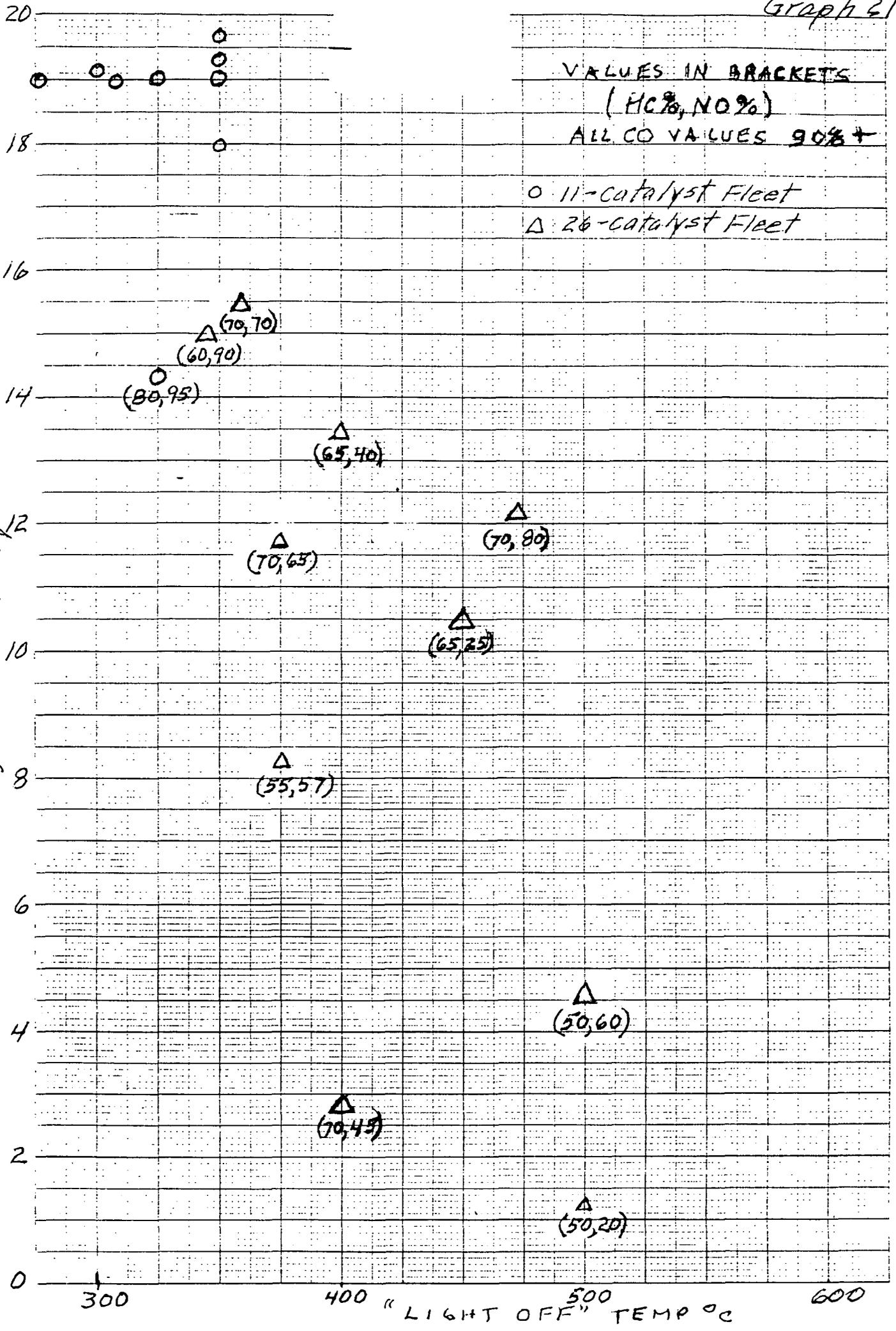
Graph 21

VALUES IN BRACKETS  
(HC%, NO%)  
ALL CO VALUES 90%+

○ 11-catalyst Fleet  
△ 26-catalyst Fleet

46 1320

AVG BET Area,  $M^2/g$



K&E 10 X 10 TO 1/2 INCH KEUFFEL & ESSER CO



SUMMARY OF 9 CATALYST FLEET - PAGE 2

TABLE I

CAT #	MILES +1000	Loc.	MN	P	Pb	O.E.T.	RATIO MN/PX10	PLI <sup>2</sup> Liters
301 G	22	I	4.20	0.27	0.22	7.3	1.55	2.3
301 H	32	M	2.05	0.19	0.09	6.7	1.08	2.3
		O	1.58	0.15	0.06	6.6	1.05	
301 H2	32	I	1.72	0.24	0.02	8.9	0.72	2.3
		M	0.92	0.12	0.03	9.8	0.76	
301 I-1	33	O	0.75	0.10	0.03	9.8	0.75	2.3
		I	0.81	0.11	0.04	8.4	0.74	
301 I-2	33	M	0.51	0.06	0.03	10.2	0.85	2.3
		O	0.91	0.06	0.03	9.3	0.68	
301 I-2	33	I	6.14	0.63	0.52	3.8	0.47	2.3
		M	2.70	0.29	0.14	4.0	0.93	
301 I-2	33	O	1.98	0.25	0.08	4.3	0.79	2.3
		I	3.39	0.37	0.33	1.2	0.92	
301 I-2	33	M	1.71	0.18	0.09	0.4	0.95	2.3
		O	1.49	0.16	0.03	0.3	0.93	





SUMMARY OF 26 CATALYST FLEET - P.3

TABLE II

CAT #	MILES / 1000	TYPE	MN	P	Pb	B.E.T.	RAT/ MN/10	PIS P LITERS
109	16.6	TWC	2.47	0.13	0.15	13.5	1.97	2.9
INLET			0.56	0.04	0.07	13.7	1.4	
MIDDLE			0.50	0.04	0.05	14.6	1.25	
OUTLET			1.36	0.08	0.12	24.4	1.7	
110	28.9	TWC	0.50	0.02	0.11	20.6	2.5	2.8
INLET			0.40	0.02	0.09	19.7	2.0	
MIDDLE			4.93	0.38	0.60	2.9	1.29	
OUTLET			2.61	0.20	0.26	1.1	1.31	
111	28.9	COC	1.72	0.14	0.22	1.9	1.22	
INLET			2.48	0.12	0.33	XXX	2.06	
MIDDLE			1.51	0.12	0.23	XXX	1.26	
OUTLET			1.08	0.08	0.11	XXX	1.35	
111	13.5	TWC	2.62	0.09	0.02	15.5	2.44	2.9
INLET			0.68	0.02	0.01	14.9	3.4	
MIDDLE			0.83	0.07	0.01	14.4	1.19	
OUTLET			1.00	0.05	0.04	21.5	2.0	
111	13.5	COC	0.57	0.04	0.02	22.0	1.4	
INLET			0.44	0.02	0.01	17.8	2.2	
MIDDLE								
OUTLET								

SUMMARY OF 26 CATALYSTS FEED - P 4

TABLE II

CAT#	MILES 1000	TYPE	MN	P	Pb	B.E.T.	RATIO MN/Pb	DISP. LITERS
112	33.7	TWC	2.72	0.17	0.12	16.0	1.6	3.03
INLET			1.11	0.19	0.0	13.3	1.23	
MIDDLE			0.89	0.06	0.0	17.3	1.48	
OUTLET								
112	33.7	CO2	1.57	0.11	0.0	16.4	1.42	3.03
INLET			0.64	0.04	0.0	18.5	1.6	
MIDDLE			0.49	0.02	0.0	20.6	2.45	
OUTLET								



Soichiro Honda Medal

CHARLES M. HEINEN

Conferral at the Honors Assembly, 1990 Winter Annual Meeting

THE SOICHIRO HONDA MEDAL recognizes an individual for an outstanding achievement or a series of significant engineering contributions in developing improvements in the field of personal transportation. This medal was established in 1983 in recognition of Soichiro Honda's exemplary achievements in the field of personal transportation.

CHARLES M. HEINEN, retired, Bloomfield Hills, Michigan, for his leadership and outstanding promotion of automotive air pollution control activities in the automotive industry.

Mr. Heinen retired from Chrysler Corporation as director of research and materials engineering after more than 40 years with the company. Following his retirement, he consulted for several years as director of the Automotive Research Group.

He began his career with Chrysler in 1934 as a stock handler while also attending night school at the Chrysler Institute. Then from 1938 to 1942, he attended the University of Michigan, Ann Arbor, as a Walter P. Chrysler Scholar where he earned B.S. and M.S. degrees in chemical engineering.

Following graduation, he worked on the Manhattan Project as a laboratory

supervisor with the Chrysler Atomic Project until 1945. For the next several years he was active in several materials fields, with particular emphasis on fuels and lubricants. Later, as a materials engineer, he was responsible for reclamation and waste disposal.

In the 1950s studies of apparently clear vehicle exhaust revealed possible environmental problems. Mr. Heinen's work for Chrysler in this area led to combustion studies, control devices, fuel economy efforts in light materials and power rating devices, alternate engines such as turbines, electric motors, and vehicles powered with hydrogen and alcohol. Nearly 100 of the 130 papers he presented in his career were as a result of his work in this field. He continued to work in this area as he rose from director of vehicle emissions planning to director of emissions/fuel economy and materials engineering and finally to director of research and materials engineering in 1978.

He was named a Fellow of the Society of Automotive Engineers (SAE) in 1980 for his outstanding contributions in the field of automotive air-pollution control and of the American Society of Metals (ASM) in 1977 for his distinguished contributions in the field of metals and materials.

Mr. Heinen has served as director of the Coordinating Research Council (CRC) and the Air Pollution Control Association, and he is also past chairman of the CRC Group on Combustion of Exhaust Gas, the SAE's Fuels and Lubricants Activity Committee and Engineering Material Council, and the Motor Vehicle Manufacturers Association of the United States' Air Quality Committee. He is a member of the U.S. Chamber of Commerce Committee on the Environment, the ASM Committee on Government and Public Affairs, and member and chairman of

numerous committees dealing with fuels, lubricants, and standardization for the American Society for Testing and Materials.